The National Atmospheric Deposition Program

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What Is the National Atmospheric Deposition Program?

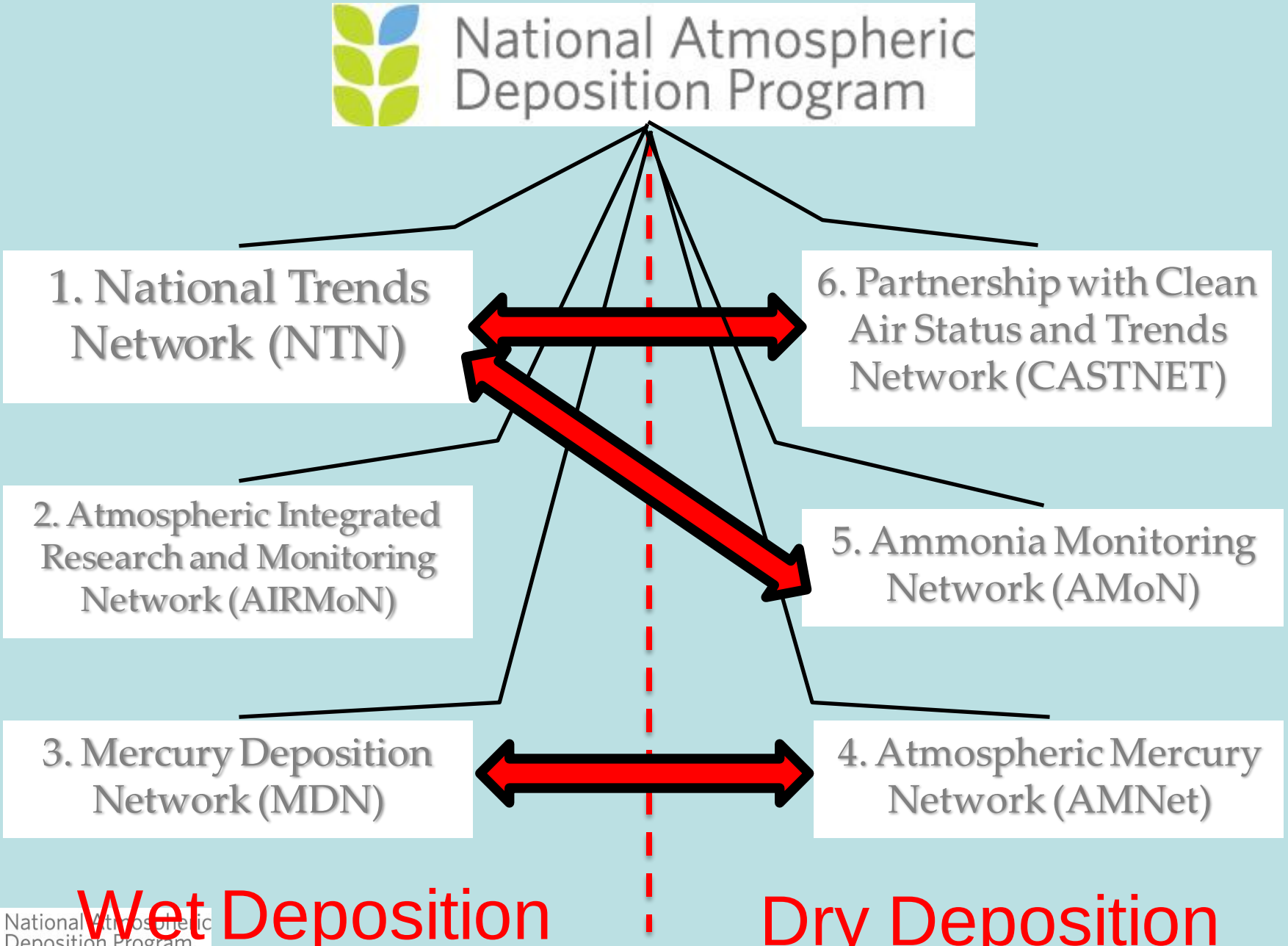
- A Cooperative Research Support Project @UI (USDA)
  - measure wet deposition of pollutants ("precipitation")
  - How much pollution is removed from the atmosphere
  - over North America
    - now South America, Asia
  - ~ 450,000 precipitation samples
    - Started in 1978, 36th year
  - "acid rain network"

National Atmospheric Deposition Program

NADP's Goal

To monitor the chemistry of precipitation (rain and snow) and in the atmosphere, as consistently and accurately as we can, for long periods to determine changes over time (trends).

National Atmospheric Deposition Program



National Atmospheric Deposition Program

Network #1: National Trends Network (NTN)

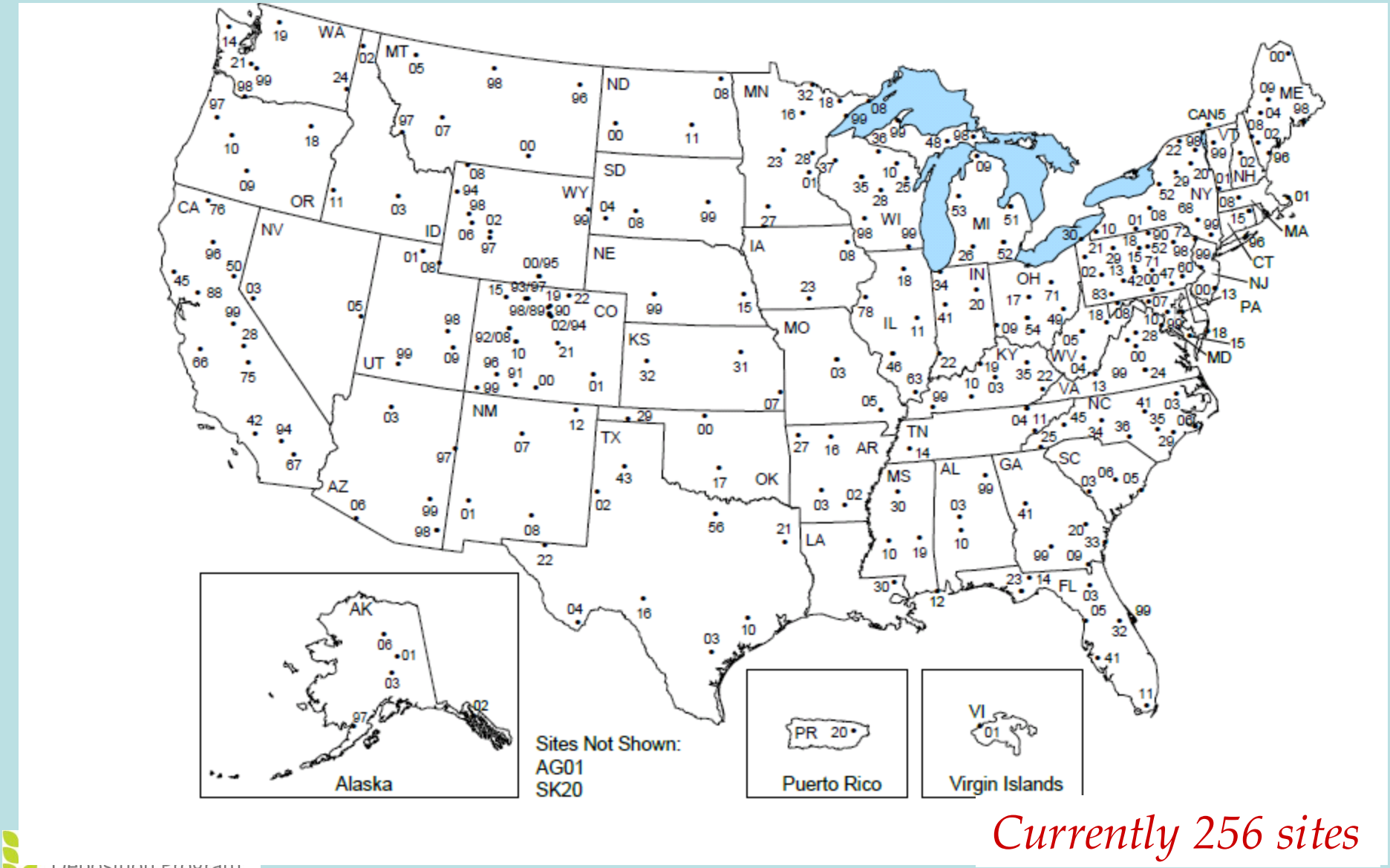
- **Collects one-week precipitation-only samples**
  concentration and deposition

- **Analyses**
  Acids (H^+, conductivity)
  $SO_4^=$, NO_3^-, NH_4^+
  Na^+, Cl-, K^+, Mg^+
  Ortho-phosphate

- **Weekly mg/L and mg/ha-week**

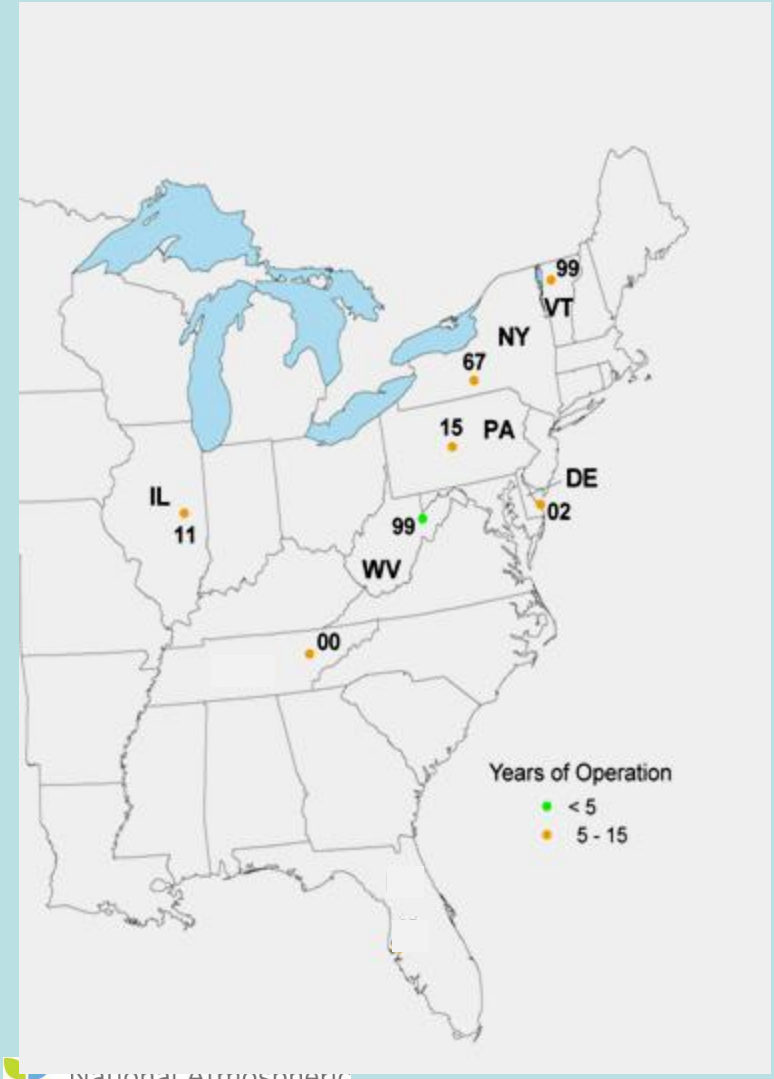
National Atmospheric Deposition Program

National Trends Network (NTN)



Currently 256 sites

Network #2: Atmospheric Integrated Research Monitoring Network (AIRMoN)



- Very similar to NTN, but collects daily when precipitation occurs
- Measures same analytes as NTN
- Samples refrigerated from collection until analysis

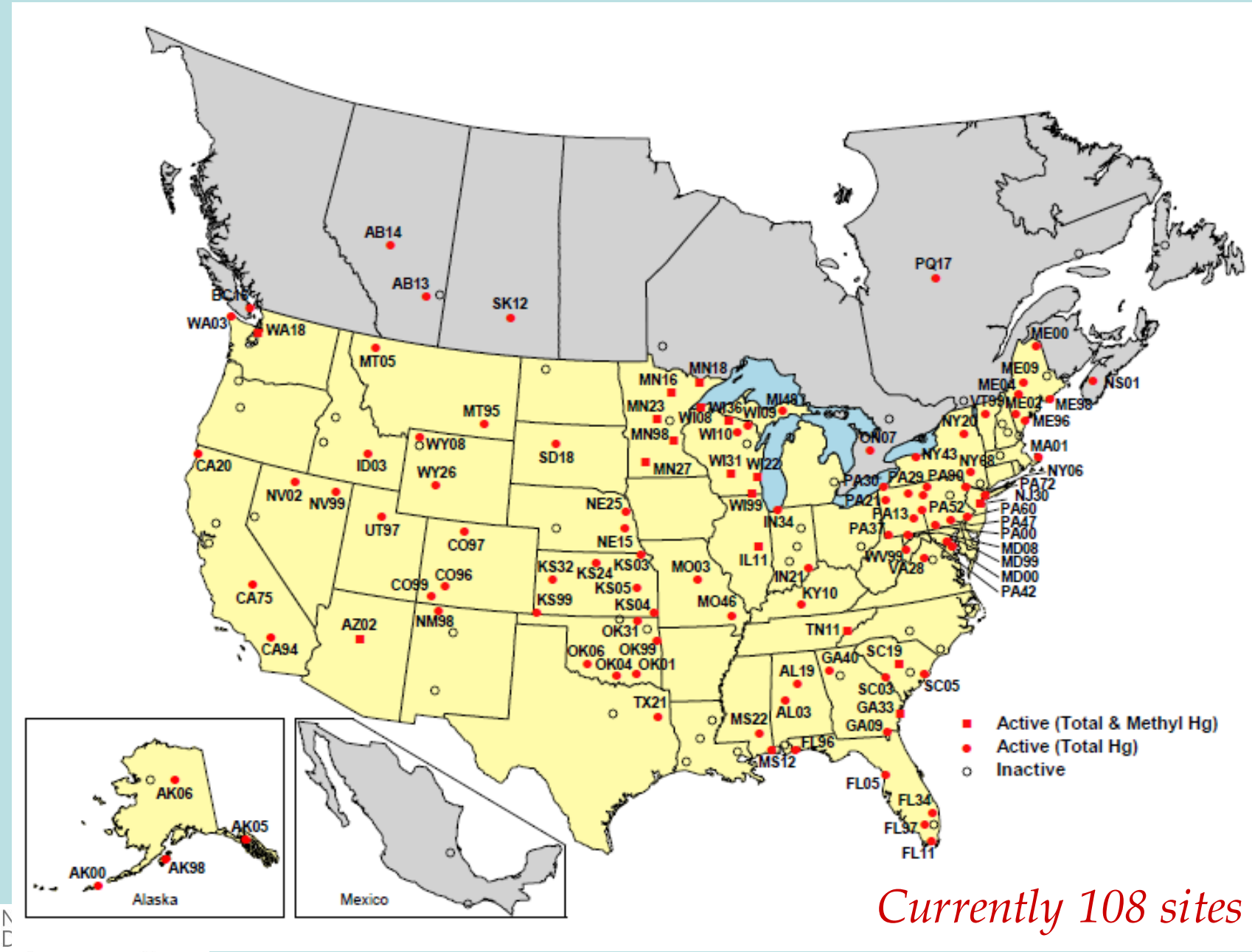
National Atmospheric Deposition Program

Network 3: Mercury Deposition Network (MDN)

- Collects one-week precipitation-only samples with MDN wet-dry collector
- Measures precipitation with gage
- Analyses
  - Total Mercury
  - Methyl Mercury
  - Other options

National Atmospheric Deposition Program

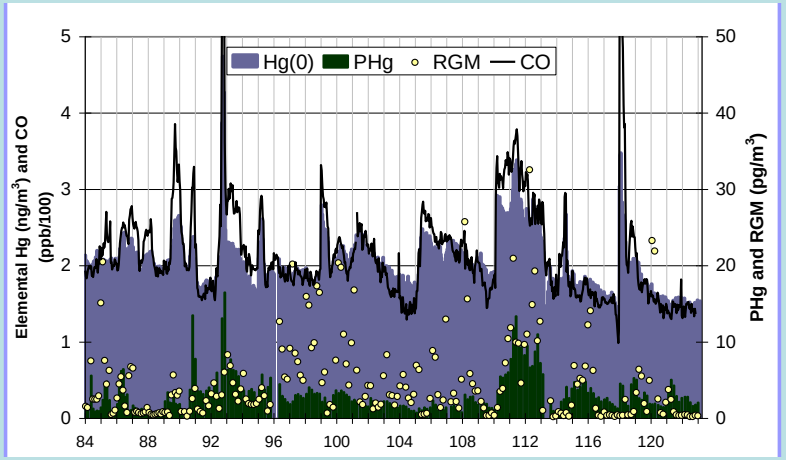
MDN Monitoring Sites



Currently 108 sites

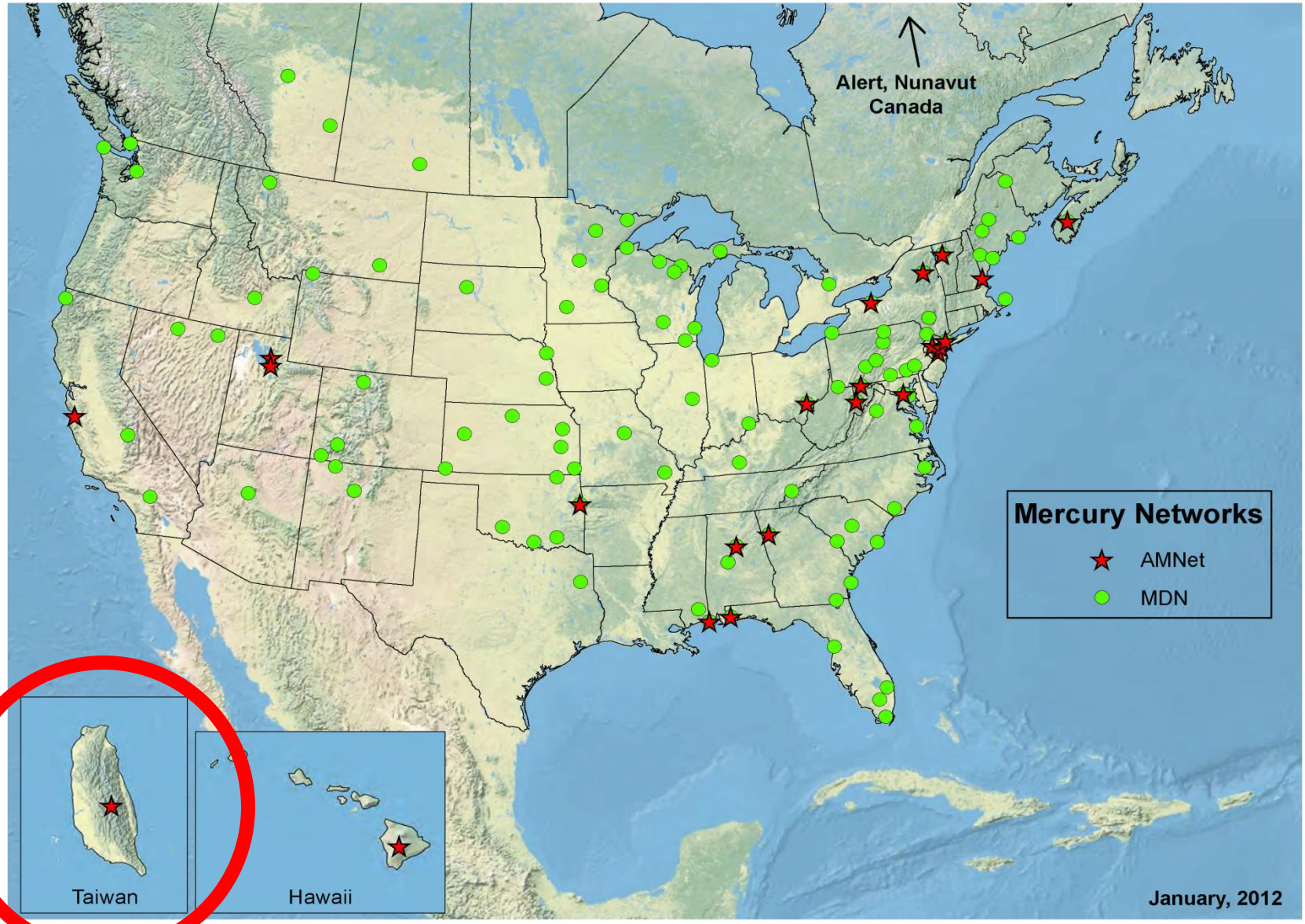
Network 4: Atmospheric Mercury Network (AMNet)

- A New NADP Network
- Measure:
  - Hg species (Tekran system)
  - meteorology and land cover variables
- *Immediate priority:* areas with strong impact from local and regional Hg sources
- Estimate *Dry Deposition*



National Atmospheric Deposition Program

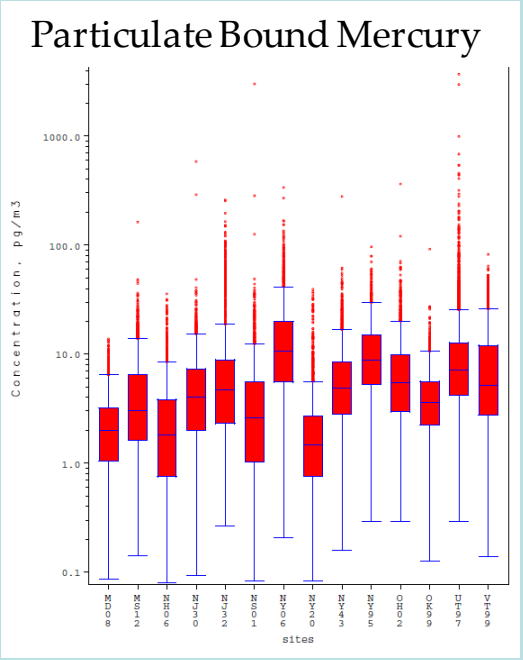
NADP Mercury Networks

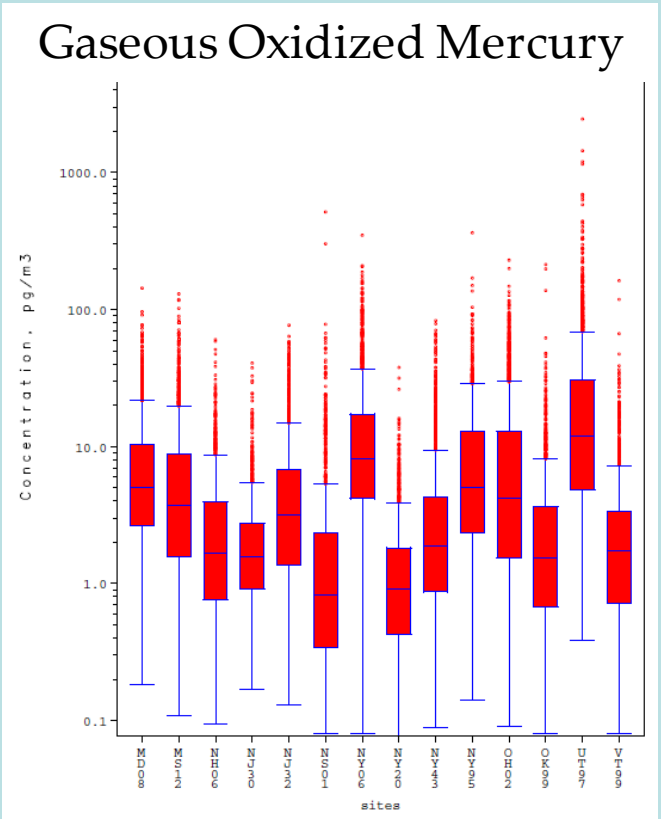


National Atmospheric Deposition Program

Goal: Dry Deposition of Mercury

Currently: 143,000 observations at 24 sites





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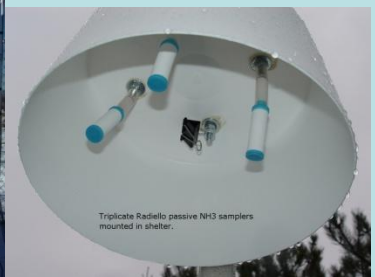
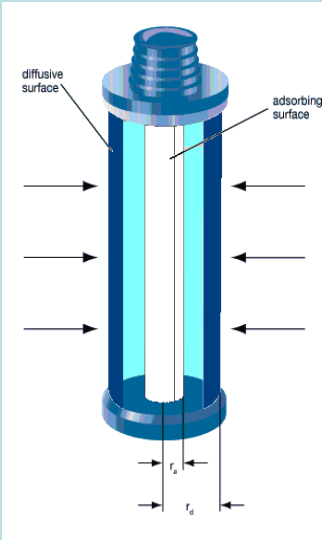
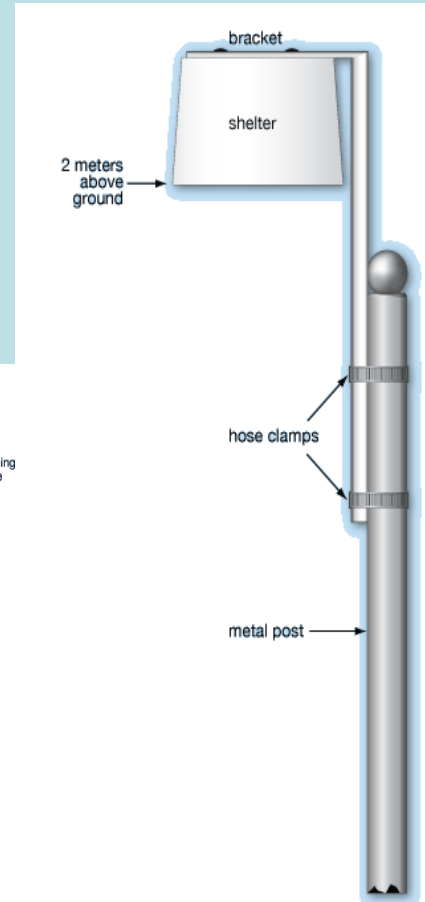
Network #5: Ammonia Monitoring Network (AMoN)

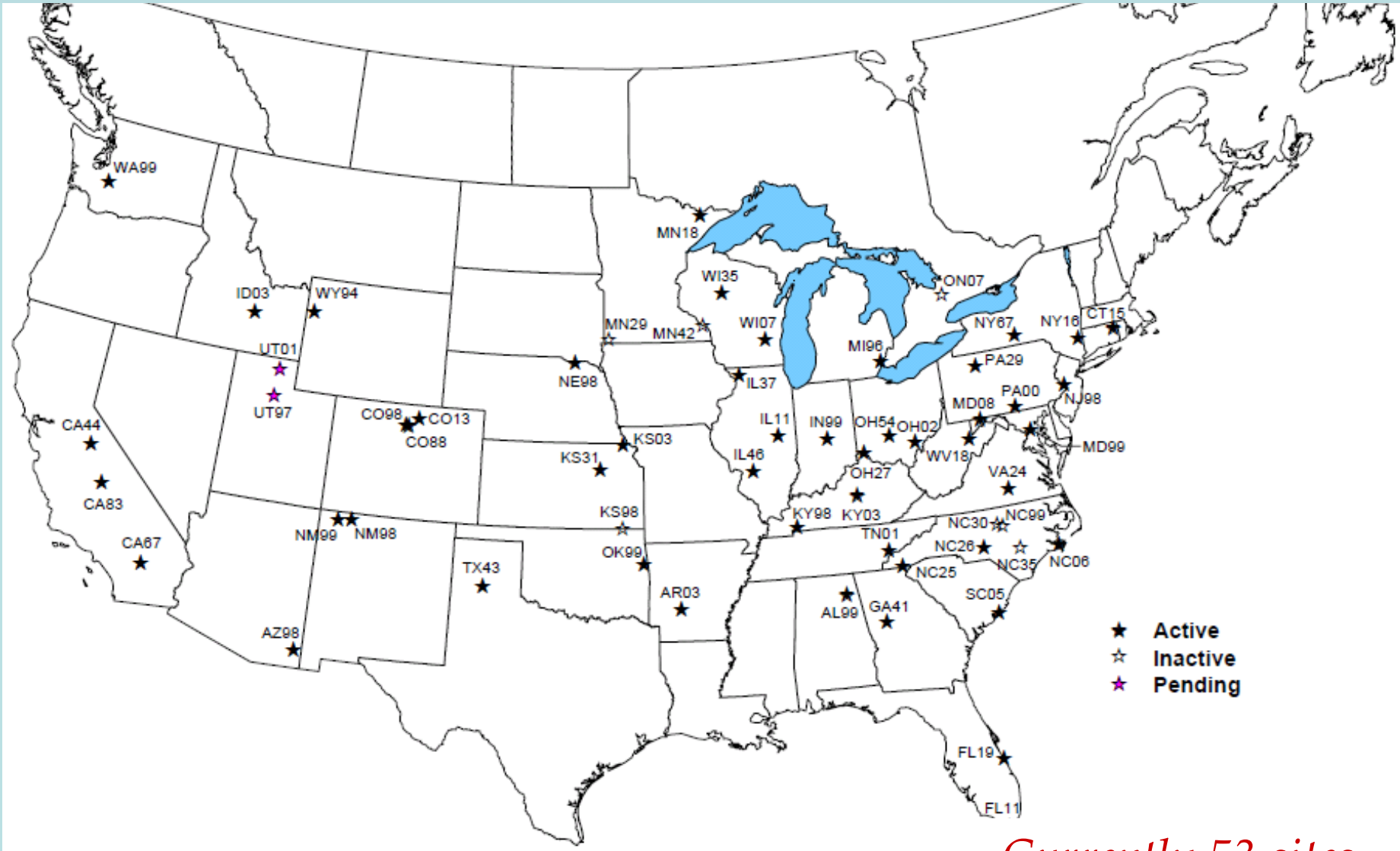
- Measure atmospheric concentrations of ammonia
- Passive samplers
- Low cost, 2 week integrated sample
  - ug NH_3/m^3







Ammonia Monitoring Network (AMoN)



Currently 53 sites

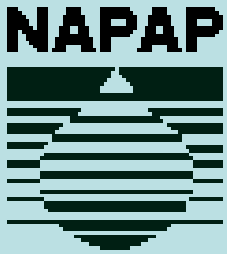
National Atmospheric Deposition Program

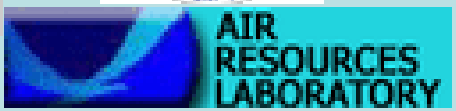
Ammonia (NH_3)

Who is NADP?

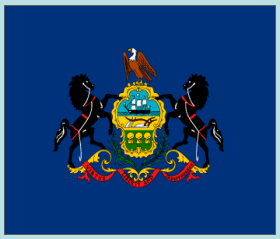
National Atmospheric Deposition Program

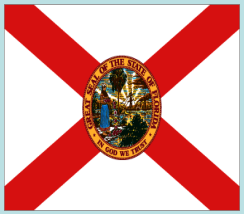
Federal Agency Members

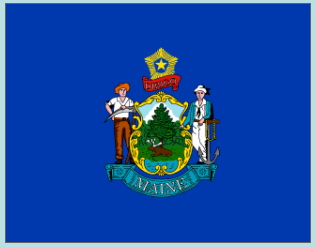


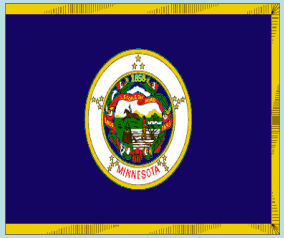


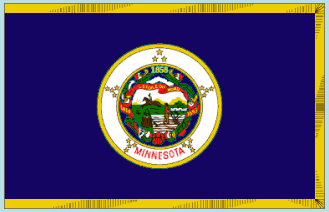
States











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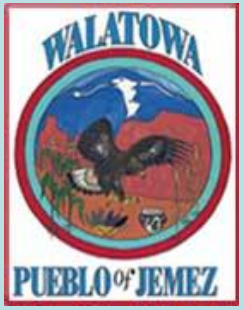
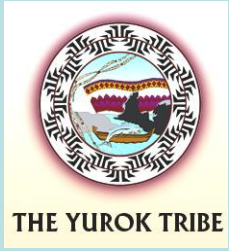
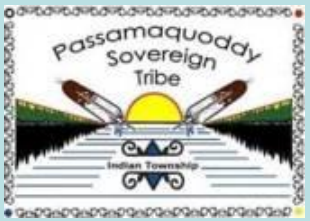
Tribal Nations







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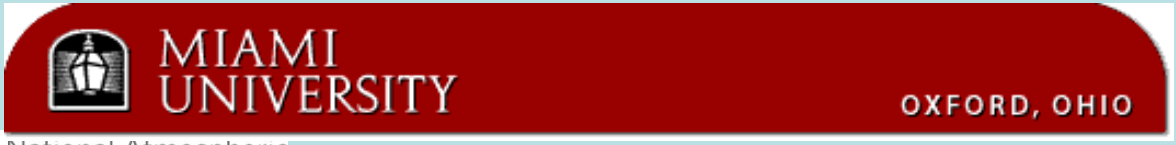
University Members



National Atmospheric Deposition Program

Other Organizations and States

Environnement Canada

Environnement Québec

Service météorologique du Canada
SMC
MSC
Meteorological Service of Canada

bp

Audubon Center of the North Woods

National Atmospheric Deposition Program

We have 250 cooperators….

Anyone can join the NADP

- If you have need of the data;
- If you want depositional measurements for your region;
- Try to make the sampling as easy and straightforward as possible.

all are welcome to join any network!

National Atmospheric Deposition Program

How Do Pollutants Get into Rain?

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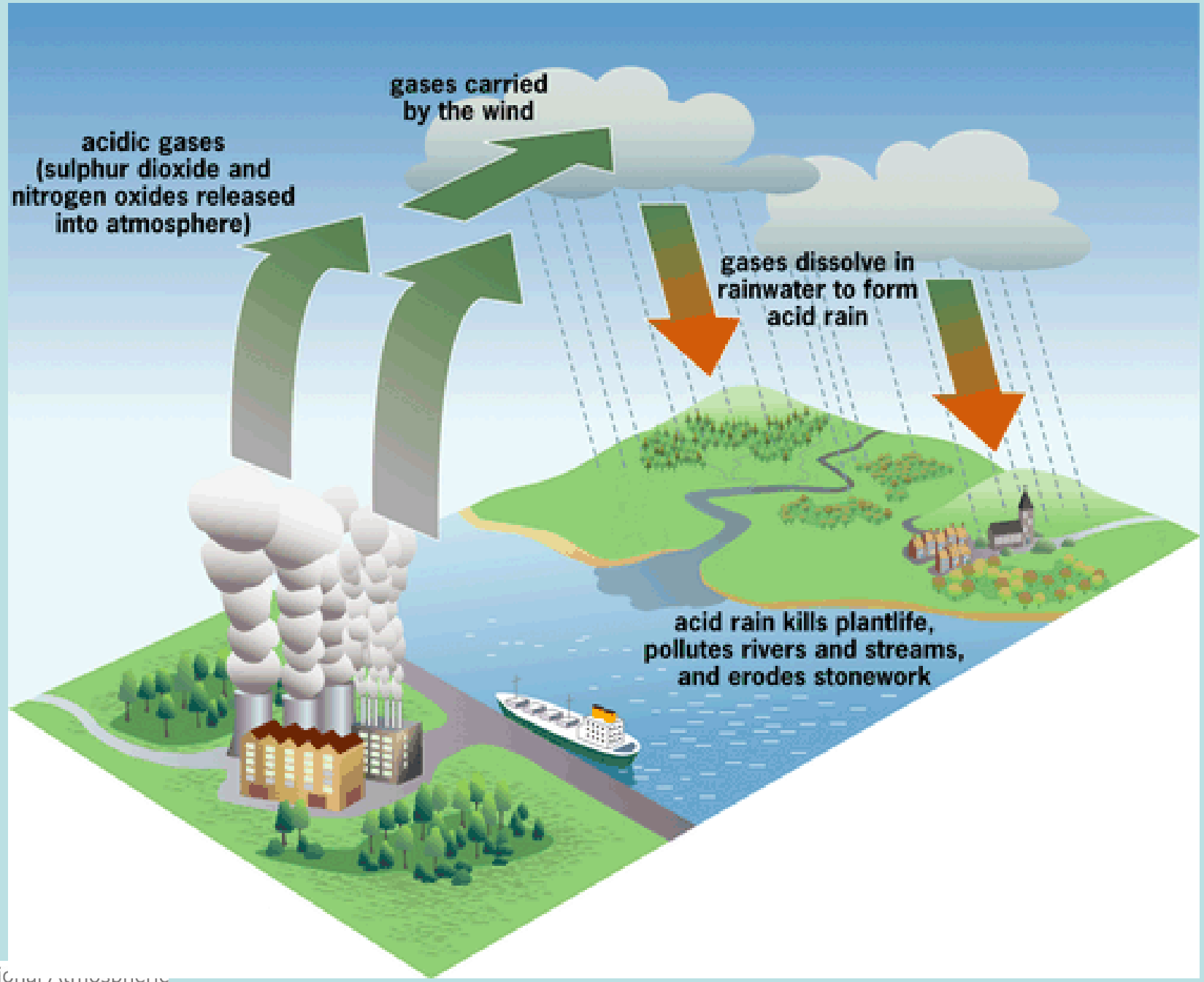
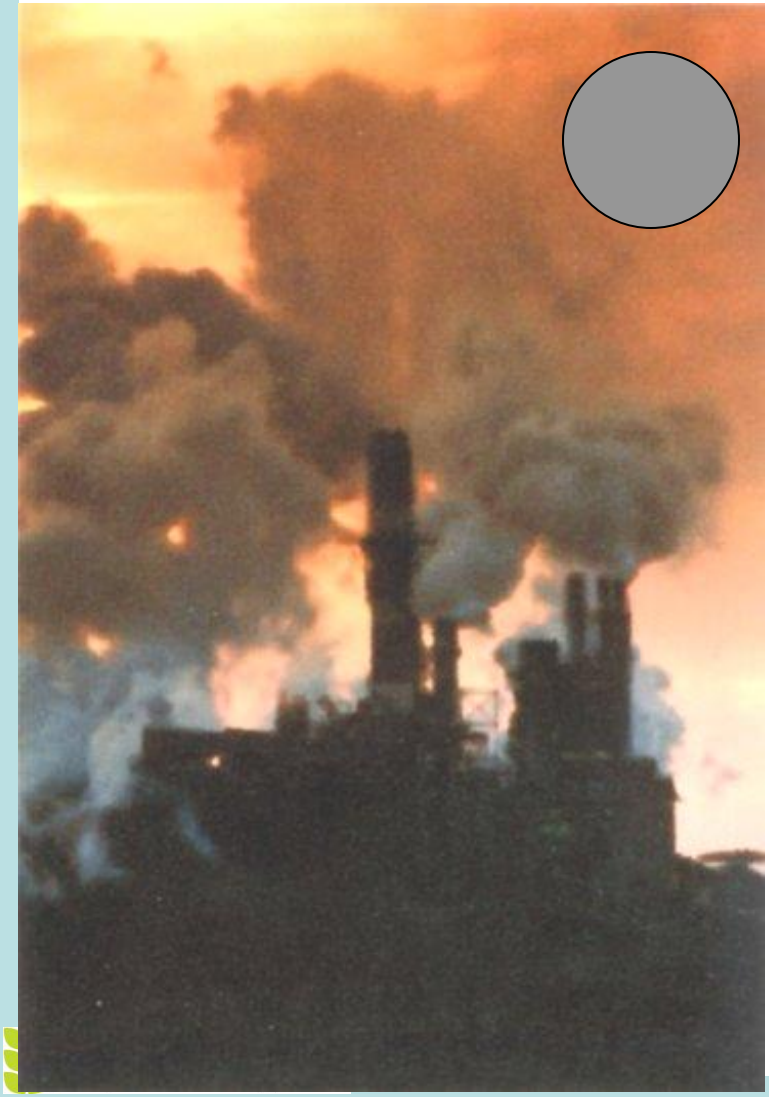
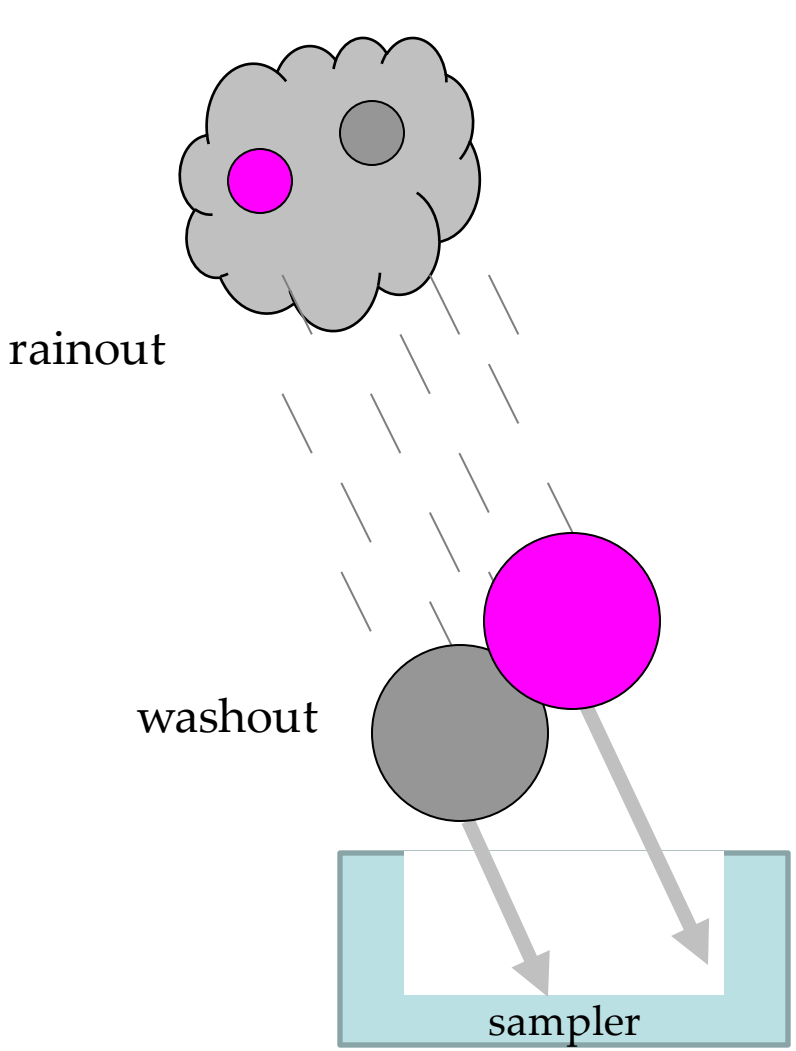


How does pollution get into precipitation?



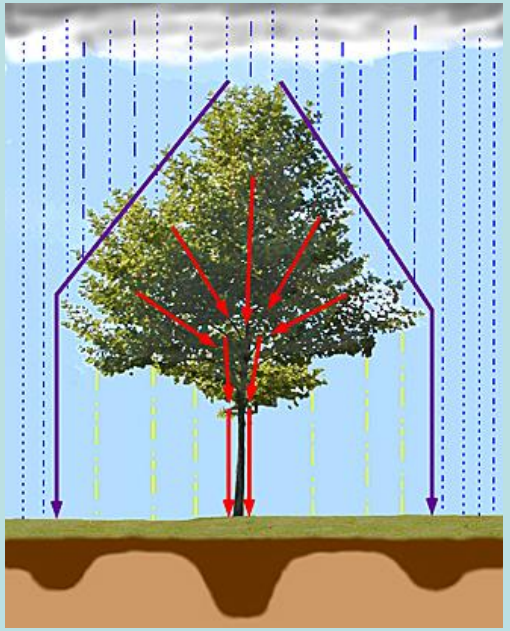


Other Mass Movement Processes…

- Dry Deposition

- Litterfall

- Throughfall



National Atmospheric Deposition Program

All of our Measurements are on the web

http://nadp.isws.illinois.edu

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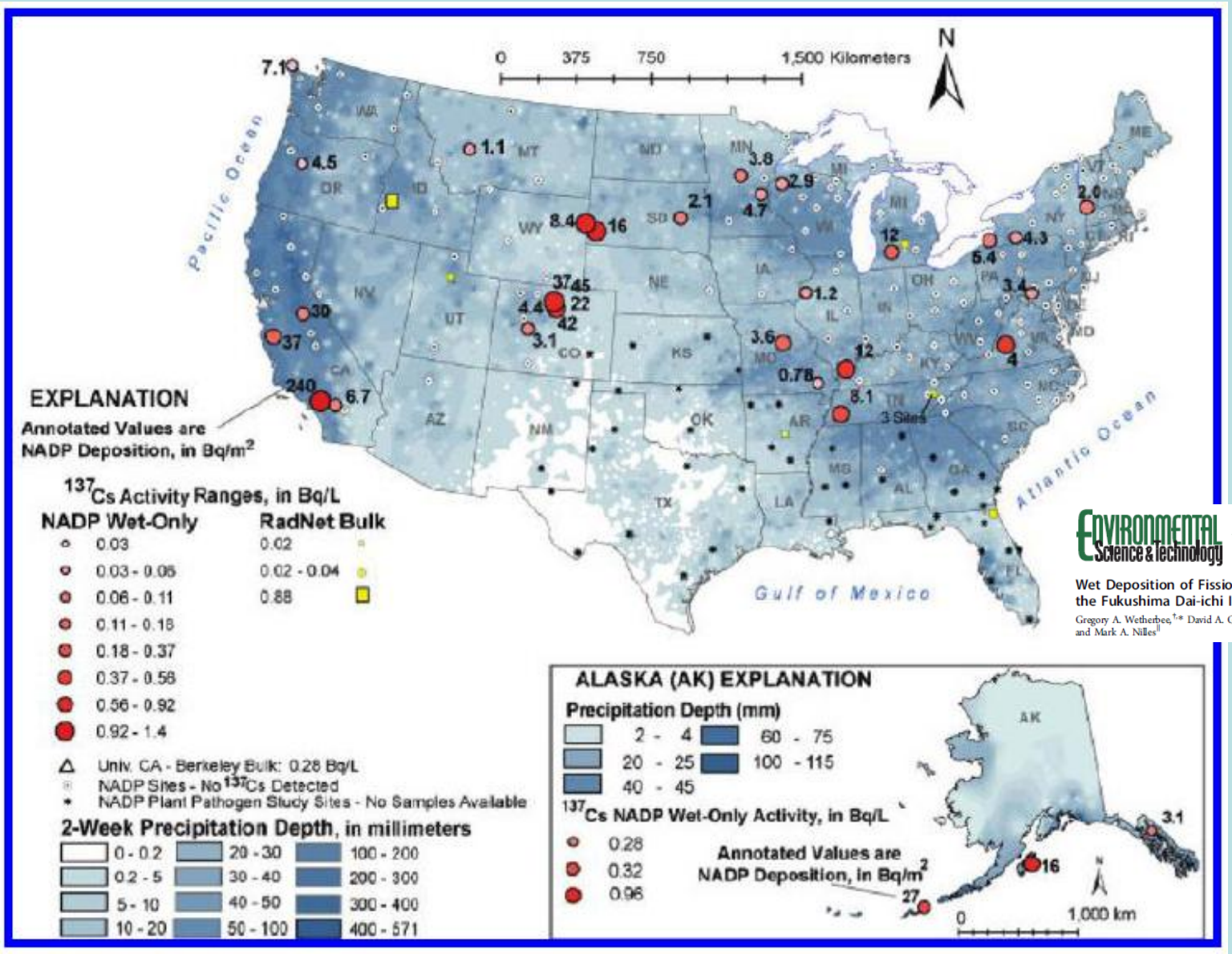
Fukushima Radiation Deposition



Environmental Science & Technology

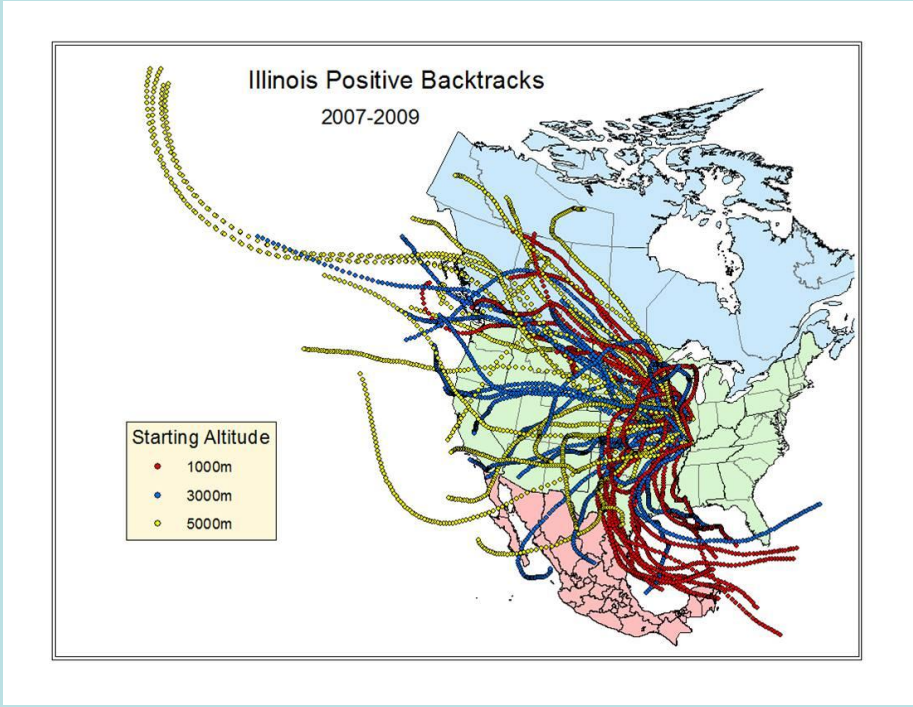
Article

pubs.acs.org/est

Wet Deposition of Fission-Product Isotopes to North America from the Fukushima Dai-ichi Incident, March 2011

Gregory A. Wetherbee,[†,*] David A. Gay,[‡] Timothy M. Debey,[§] Christopher M.B. Lehmann,[‡] and Mark A. Nilles[∥]

Asian Soybean Rust

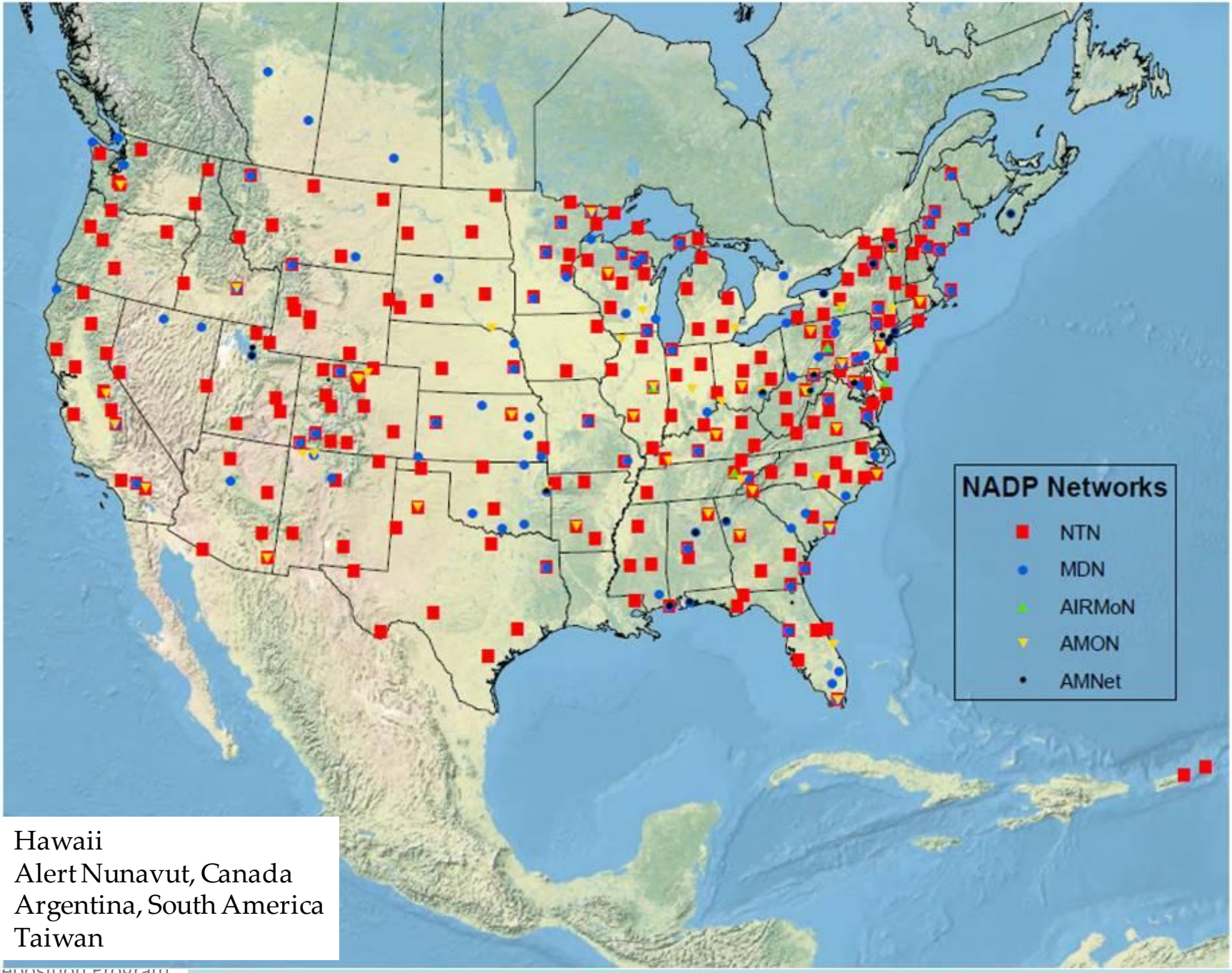


National Atmospheric Deposition Program

Where

Do We Measure It?

National Atmospheric Deposition Program



Hawaii
Alert Nunavut, Canada
Argentina, South America
Taiwan

AIRMoN PA15
Penn State Univ., PA

MDN FL11
Everglades N.P., FL

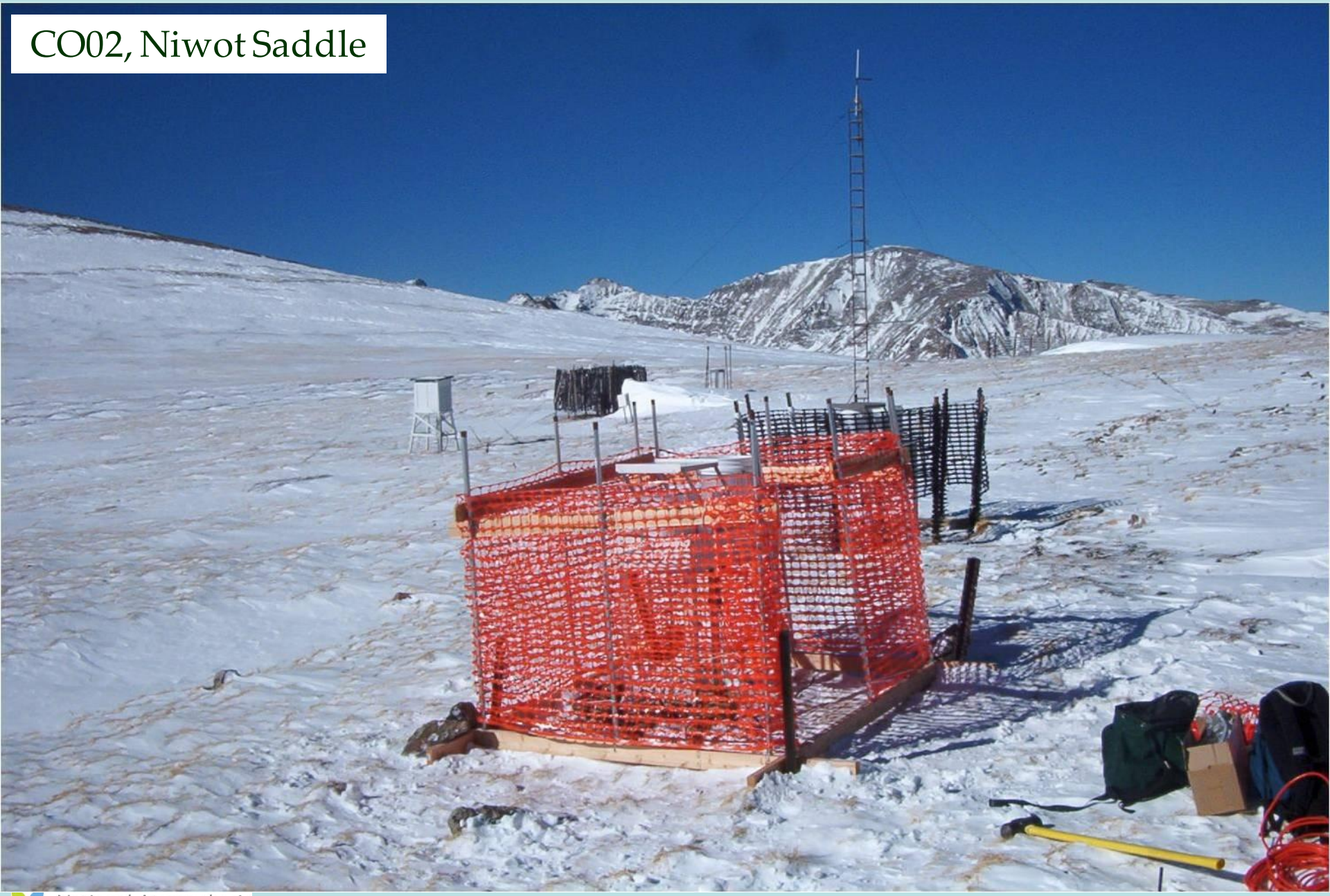
National Atmospheric Deposition Program

NTN NV05
Great Basin National Park

NTN IL11
Bondville, IL

National Atmospheric Deposition Program

CO02, Niwot Saddle



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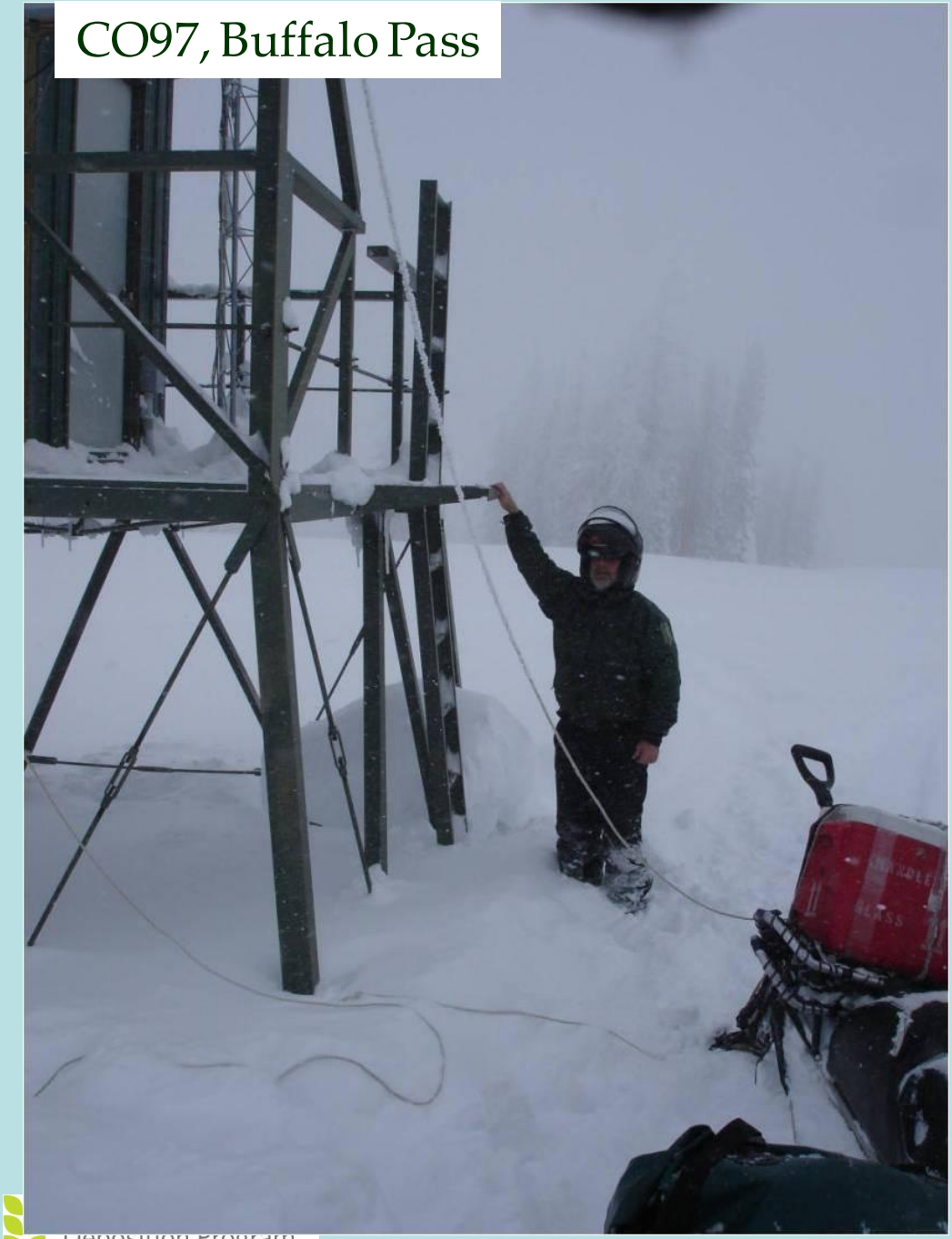
CO97, Buffalo Pass



Alert, Nunavut, Canada

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New York City

Washington DC

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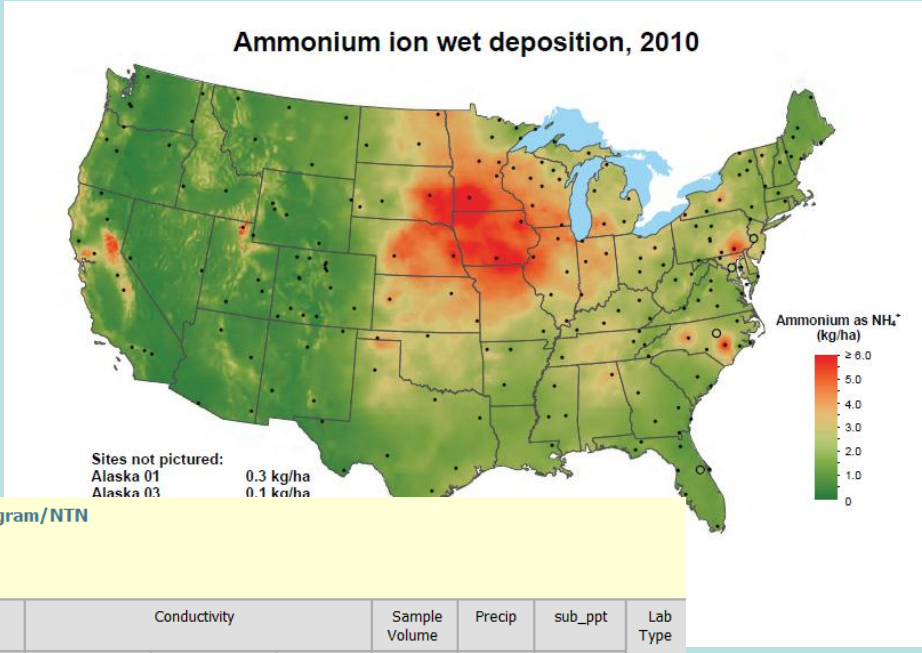
MDN43

Results of all of this?

National Atmospheric Deposition Program

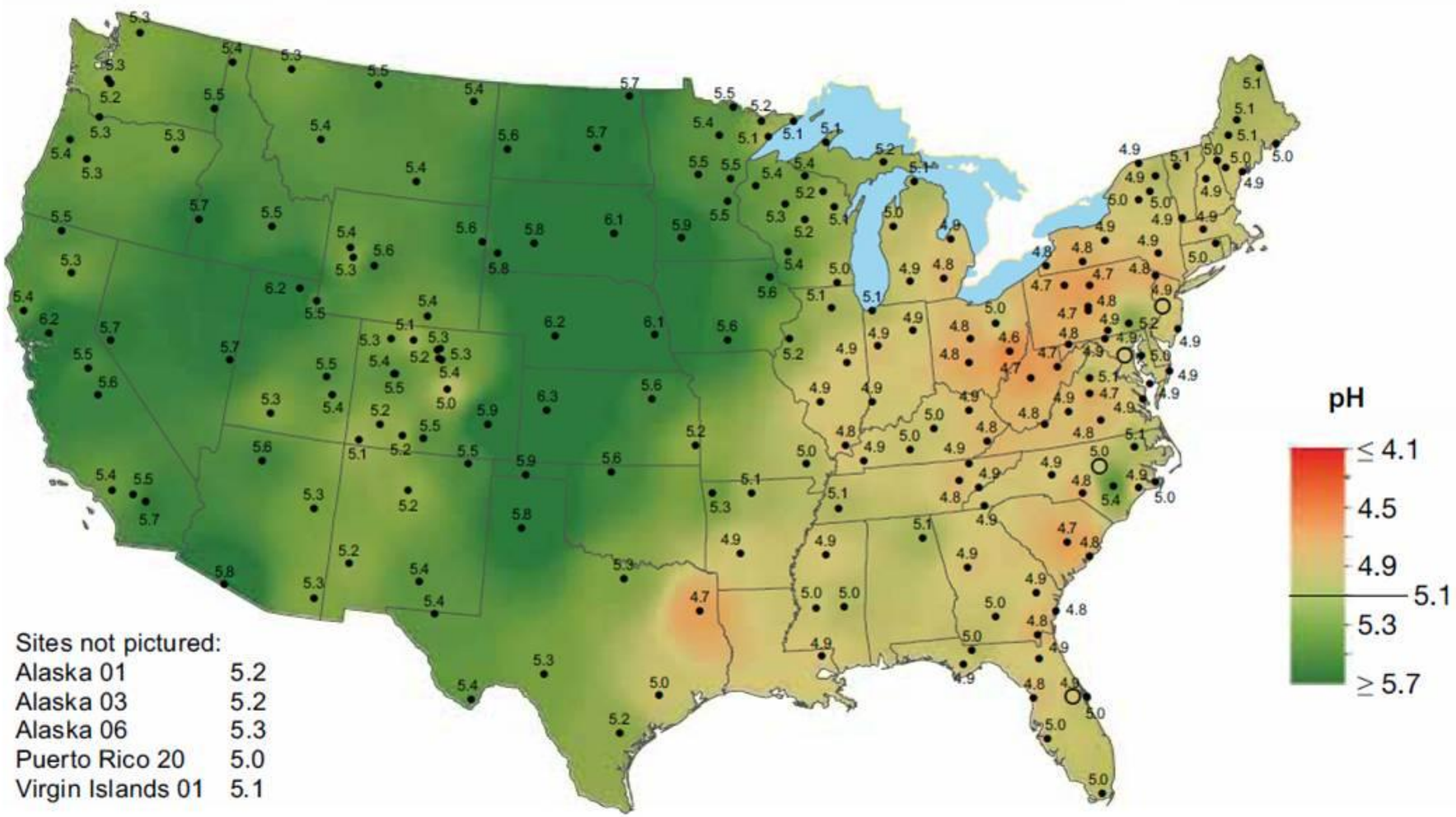
Data……..



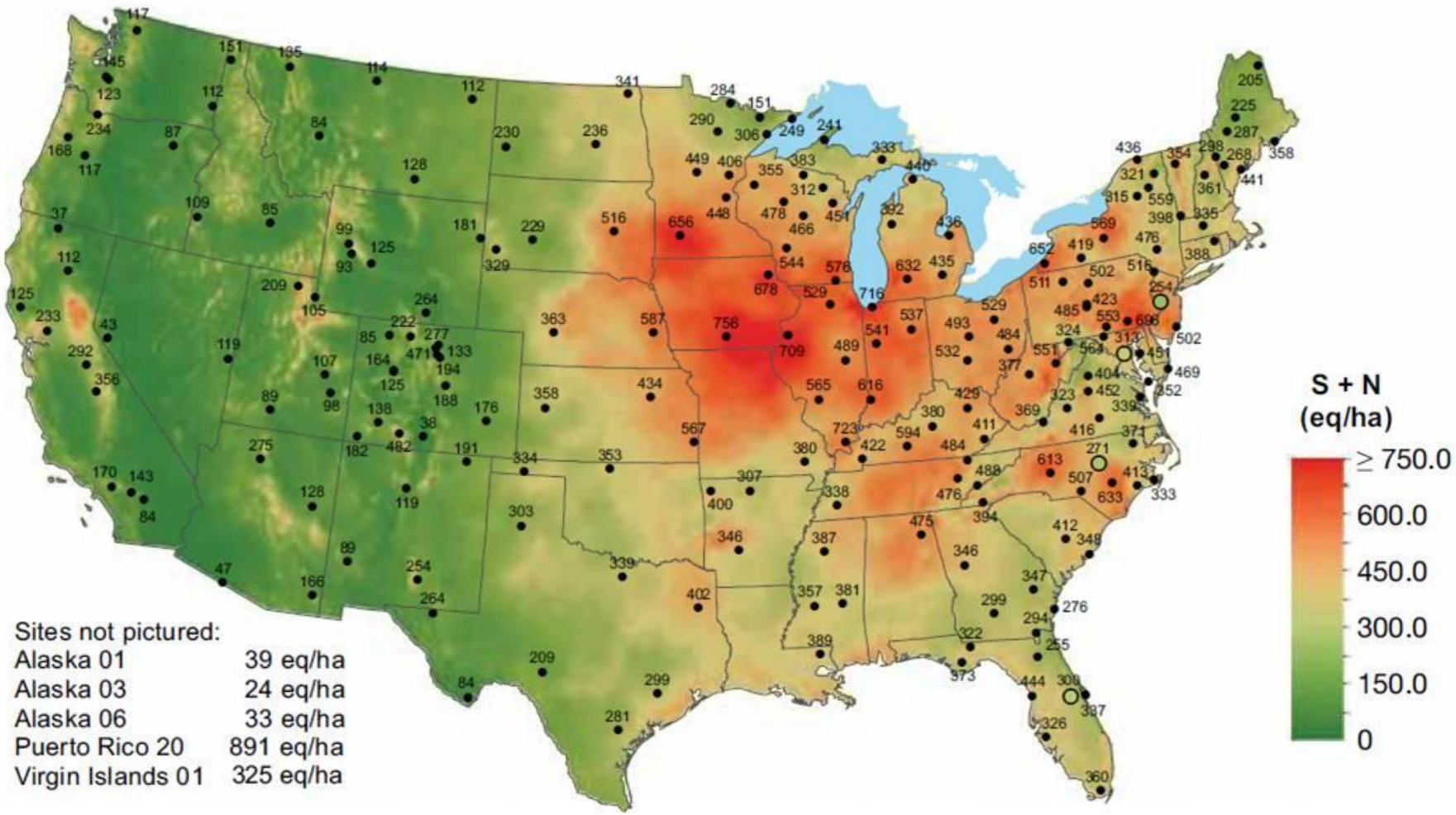
National Atmospheric Deposition Program/NTN
Weekly Samples

Site ID	Date On	Date Off	Ca	Mg	K	Na	NH_4	NO_3	Cl	SO_4	pH			Conductivity			Sample Volume	Precip	sub_ppt	Lab Type
			mg/L								Lab	Field	FV	Lab	Field	FV	ml	mm	mm	
IL11	02/27/1979	03/06/1979	0.150	0.011	0.011	0.025	0.080	0.900	0.150	1.950	4.50	--	-	16.0	--	-	3417.0	48.26	48.260	w
IL11	03/06/1979	03/13/1979	0.170	0.015	0.013	0.030	0.550	2.750	0.230	3.350	4.16	--	-	37.7	--	-	620.0	10.67	10.670	w
IL11	03/13/1979	03/20/1979	0.210	0.047	0.015	0.268	0.150	1.200	0.500	2.950	4.26	--	-	30.2	--	-	1872.0	24.89	24.890	w
IL11	03/20/1979	03/27/1979	0.190	0.016	0.012	0.031	0.250	1.850	0.100	2.600	4.20	--	-	36.0	--	-	1733.0	28.70	28.700	w
IL11	03/27/1979	04/03/1979	0.240	0.031	0.023	0.175	0.350	1.750	0.200	3.750	4.24	--	-	29.0	--	-	1499.0	24.89	24.890	w
IL11	04/03/1979	04/10/1979	0.260	0.033	0.024	0.144	0.450	1.700	0.100	3.300	4.34	--	-	21.5	--	-	1040.0	15.24	15.240	w
IL11	04/10/1979	04/17/1979	0.330	0.039	0.046	0.133	0.280	1.100	0.200	2.950	4.44	--	-	22.0	--	-	4093.0	78.74	78.740	w
IL11	04/17/1979	04/24/1979	--	--	--	--	--	--	--	--	--	--	-	--	--	-	--	39.12	39.120	w
IL11	04/24/1979	05/01/1979	0.140	0.024	0.010	0.029	0.320	1.400	0.100	2.500	4.36	--	-	16.0	--	-	1570.5	20.57	20.570	w
IL11	05/01/1979	05/08/1979	0.130	0.025	0.018	0.046	0.920	1.100	0.180	4.100	4.33	--	-	26.1	--	-	534.5	9.40	9.400	w
IL11	05/08/1979	05/15/1979	0.500	0.064	0.056	0.027	0.900	2.200	0.150	2.900	4.90	--	-	16.0	--	-	1329.0	19.81	19.810	w
IL11	05/15/1979	05/22/1979	--	--	--	--	--	--	--	--	--	--	-	--	--	-	--	-7.00	0.127	t
IL11	05/22/1979	05/29/1979	0.310	0.043	0.034	0.043	0.600	2.250	0.100	3.600	4.23	--	-	31.3	--	-	349.0	6.35	6.350	w
IL11	05/29/1979	06/05/1979	--	--	--	--	--	--	--	--	--	--	-	--	--	-	--	-7.00	0.127	t
IL11	06/05/1979	06/12/1979	0.120	0.029	0.036	0.170	0.250	1.250	0.150	2.680	4.33	--	-	23.0	--	-	353.5	4.83	4.830	w
IL11	06/12/1979	06/19/1979	0.920	0.146	0.050	0.068	0.700	2.850	0.150	4.800	4.29	--	-	36.0	--	-	182.0	2.54	2.540	w
IL11	06/19/1979	06/26/1979	0.980	0.189	0.100	0.405	0.600	2.850	0.550	7.600	4.04	--	-	49.9	--	-	158.5	2.03	2.030	w
IL11	06/26/1979	07/03/1979	0.380	0.065	0.027	0.092	0.550	2.250	<0.050	3.150	4.47	--	-	25.5	--	-	1022.5	15.49	15.490	w
IL11	07/03/1979	07/10/1979	0.400	0.086	0.549	0.189	1.800	2.550	0.400	5.800	4.18	--	-	45.4	--	-	916.5	14.22	14.220	w
IL11	07/10/1979	07/17/1979	0.380	0.034	0.025	0.132	0.400	2.000	<0.050	3.350	4.21	--	-	21.2	--	-	1680.5	24.89	24.890	w
IL11	07/17/1979	07/25/1979	--	--	--	--	--	--	--	--	--	--	-	--	--	-	5421.5	80.26	80.260	w

“Acid Rain” is still an issue.

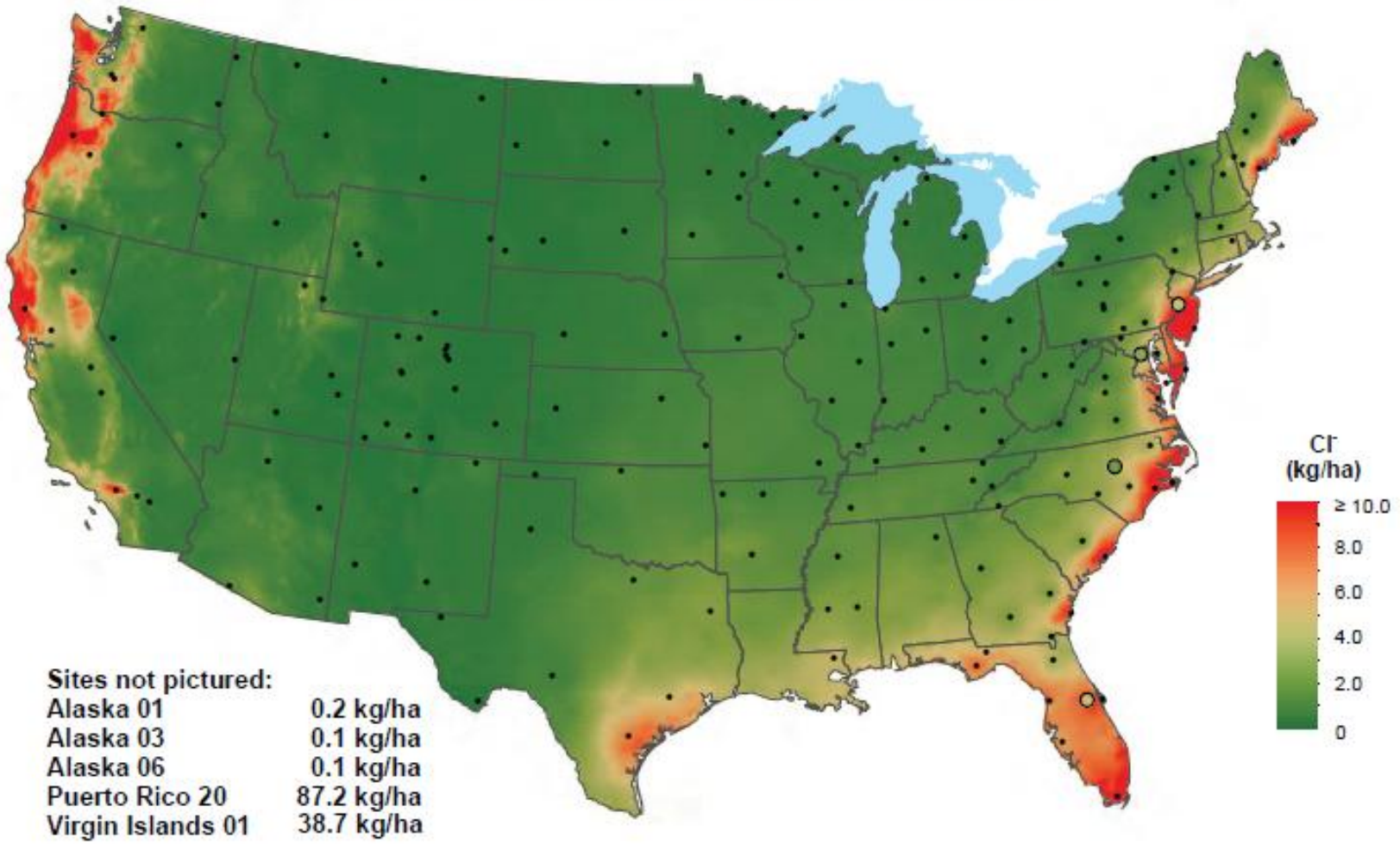


Sulfate and Nitrate Deposition Rates, 2010



National Atmospheric Deposition Program

Chloride ion wet deposition, 2010

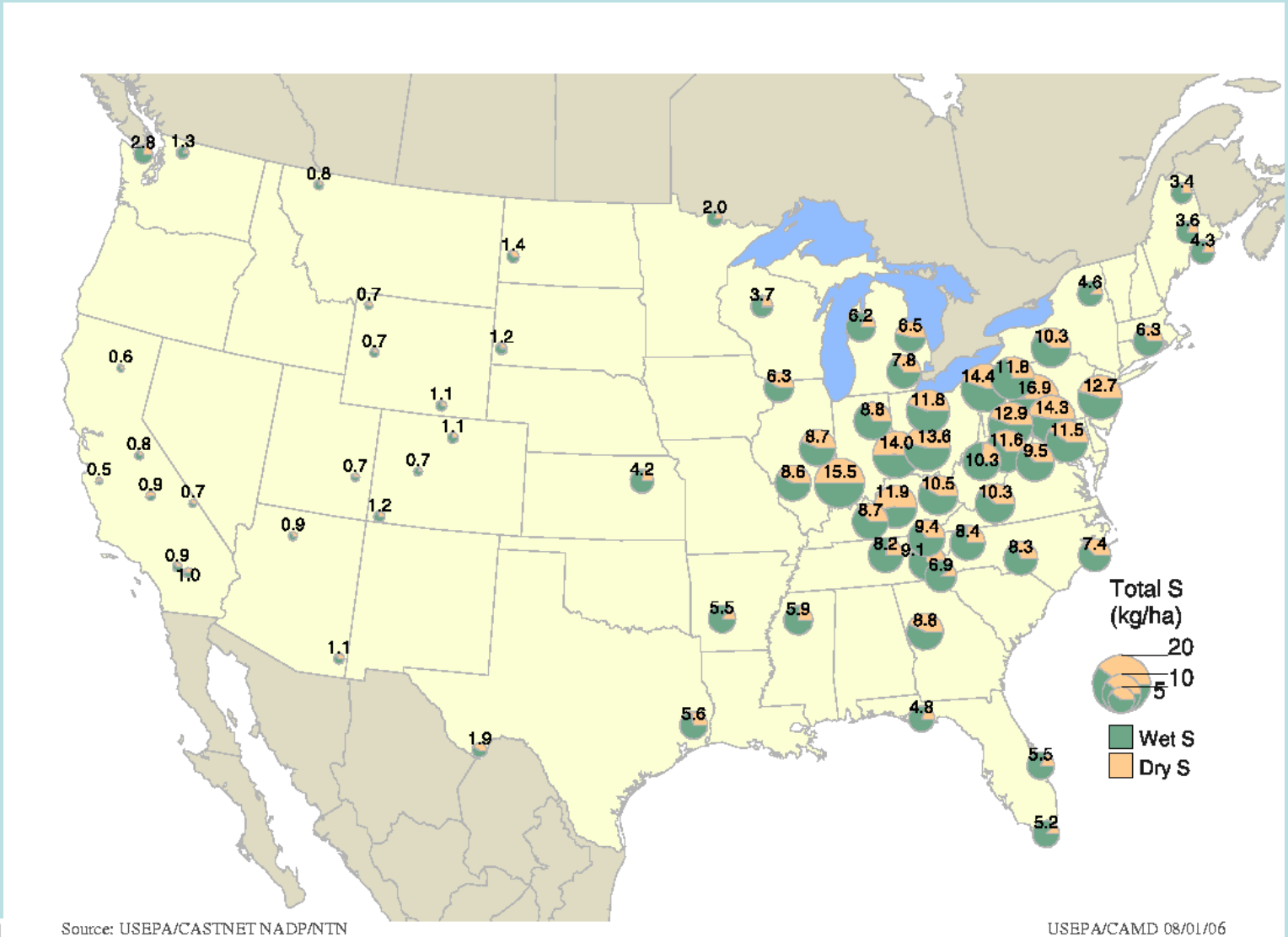


Sites not pictured:

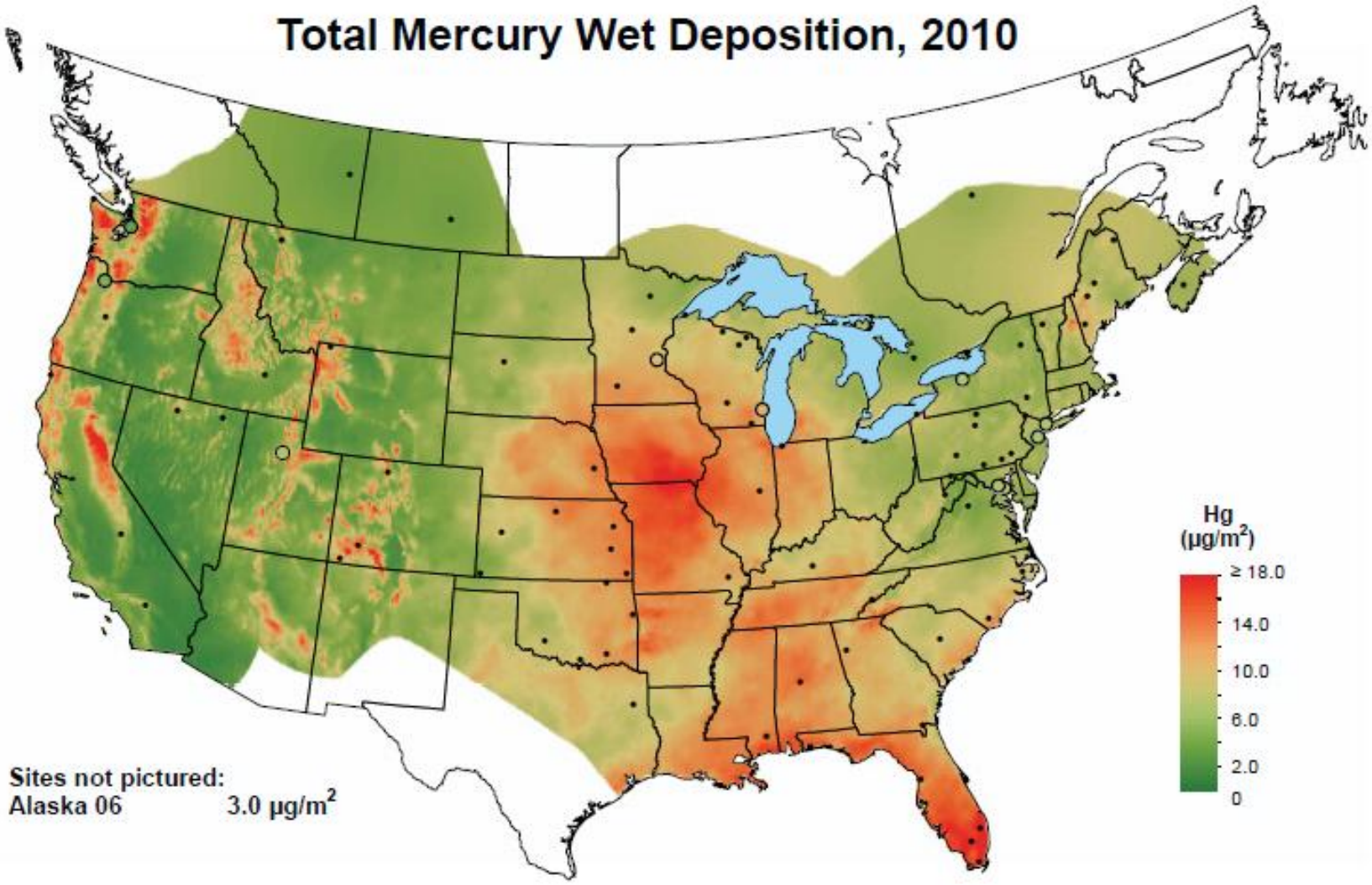
Alaska 01	0.2 kg/ha
Alaska 03	0.1 kg/ha
Alaska 06	0.1 kg/ha
Puerto Rico 20	87.2 kg/ha
Virgin Islands 01	38.7 kg/ha

National Atmospheric Deposition Program/National Trends Network
http://nadp.isws.illinois.edu

Total Sulfate Deposition (w/CASTNET)



Total Mercury Wet Deposition, 2010

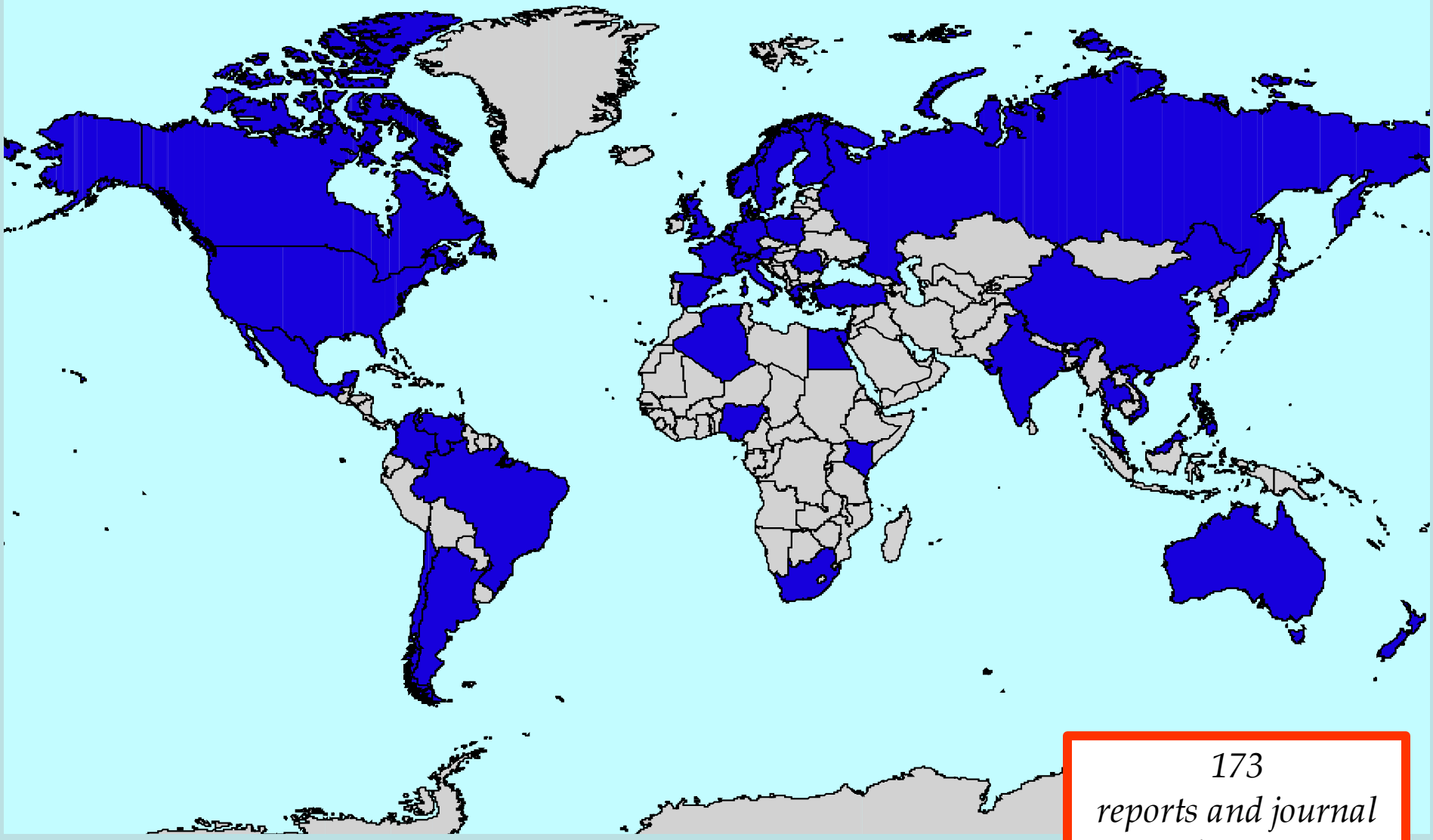


National Atmospheric Deposition Program/Mercury Deposition Network
http://nadp.isws.illinois.edu

Bottom Line

- Long-term monitoring to measure trends;
- consistently and as accurately as possible;
- check our accuracy (quality assurance);
- data online for everyone

Registered Users of NADP Data



173
reports and journal articles in 2011

Animation

National Atmospheric Deposition Program

The National Atmospheric Deposition Program

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